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Central & Arctic Region
Canadian Science Advisory Secretariat
Science Advisory Report 2008/057

ADVICE ON SELECTIVE HUNTING OF EASTERN CANADIAN ARCTIC-WEST GREENLAND BOWHEAD WHALES

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Figure 1: Range and main summer distribution of the Bering-Chukchi-Beaufort (BCB) and Eastern Arctic (EA) bowhead whale populations in Canada

Context:

Bowhead whales distributed in the Eastern Canadian Arctic and West Greenland are now considered to be a single population that is larger than previously estimated. This population is shared within Canada (Nunavut and Nunavik) and with Greenland. The population appears to be segregated within its range by age and sex; higher proportions of females and juveniles are observed in the Northern Hudson Bay-Foxe Basin area and also within Prince Regent Inlet.

Nunavut Inuit resumed subsistence hunts for bowheads in 1996; Nunavik (northern Quebec) Inuit resumed bowhead hunting in 2008. In 2008, three successful bowhead hunts were conducted (two in Nunavut, one in Nunavik). Each of these subsistence bowhead hunts was authorized by a Fisheries and Oceans Canada (DFO) license, which directs hunting to adult whales and prohibits hunting of bowhead calves (<25') or whales accompanied by calves.

Hunting communities have targeted large bowheads so that more maqtaq is available for distribution. It can be difficult to differentiate between adult males and females. Of the eight bowheads landed in Nunavut between 1996 and 2008, six were male and two were female.

Fisheries and Aquaculture Management sector of DFO posed the following questions to the Science sector:

1) How should bowhead hunting in the Eastern Canadian Arctic be structured to minimize its impact on the recovery of the Eastern Canadian Arctic-West Greenland population?

2) Are there certain geographic areas where subsistence hunting should target juvenile bowheads as opposed to adult animals?

This report documents the response to these questions based on population modeling and published literature.

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Context:

Canada

SUMMARY

To minimize impacts on the recovery of the Eastern Canadian Arctic and West Greenland population of bowhead whales this assessment concluded:

- Where possible, hunts should target juvenile bowhead whales (between 7.5 m and 13.5 m or between 24.6 feet and 44.3 feet in total length, or ≤ 4.5 m or 14.8 feet in skull length).
- Hunting of adult females should be minimized everywhere and avoided completely in Northern Foxe Basin.
- Northern Foxe Basin hunts should target only juveniles, because the adults there are likely to be reproductive females.
- To reduce the risk of taking adult females, hunters should avoid animals longer than 16.2 m or 53.2 feet in total length (> 5.4 m or 17.7 feet in skull length).

BACKGROUND

Eastern Canadian Arctic and West Greenland bowhead whales were hunted commercially in the past four centuries, and for subsistence for longer than that. The population was depleted as a result of the commercial whaling and assessed, together with bowheads in the western Arctic, by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) as Endangered in 1980. In the spring of 2005, COSEWIC split bowheads in the eastern Arctic into the Davis Strait-Baffin Bay population and the Hudson Bay-Foxe Basin population, and assessed both as Threatened. If listed under the *Species at Risk Act* (SARA), a recovery strategy will have to be developed.

In the eastern Canadian Arctic and in Greenland, there is a limited subsistence hunt of bowhead whales, but there is interest in increasing the take for Canadian Inuit and West Greenlanders. The International Whaling Commission recently allocated two strikes[1] per year for West Greenland, with future hunts pending review of further population assessment. In Canada, hunting is co-managed by DFO, the Nunavut Wildlife Management Board, and the Nunavik Marine Region Wildlife Board. Since the renewal of licensed bowhead hunting in the eastern Canadian Arctic in 1996, hunting rates within Canada have been based on a two-stock hypothesis and scientific advice produced in 1995-96 which advised a maximum take of one whale every three years for the Hudson Bay-Foxe Basin population and one whale per 13 years for the Davis Strait-Baffin Bay population (Cosens *et al.* 1998).

In 2007, scientific advice based on a conservative interpretation of a Potential Biological Removal (PBR) analysis of a single population, with an estimated population of 14,400 whales (Dueck *et al.* 2007), indicated that total human-induced removals of up to 18 whales/year were unlikely to jeopardize population recovery (DFO 2008). However, that assessment provided no information on the relative impacts of biases in the hunt structure on population recovery. Evidence suggests that the population is segregated within its range by age and reproductive class (Cosens and Blouw 2003), making it potentially vulnerable to biases in the hunt toward specific age or reproductive classes. Currently, the provisions of the hunt license prohibit hunting of bowhead calves (<25') or whales accompanied by calves, however since it is not possible to determine the gender of unaccompanied animals in the field a female-biased hunt is possible.

[1] A strike is any contact made between the harpoon head and a whale.

Given the large uncertainties associated with the partial population estimate (i.e., 14,400. 95% CI 4,811-43,105) and potential biases in the hunt, theoretical trajectories of the population as a function of various hypothetical hunting scenarios and population characteristics were examined.

ANALYSIS

There are two sources of information to assess selective hunting and recovery of Eastern Canadian Arctic-West Greenland bowhead whales. The first is a paper by Cosens and Blouw (2003) which shows how age and reproductive classes of bowheads are segregated geographically in summer. They found there is a high proportion of calves and juvenile bowhead whales, accompanied by some adult females, in Northern Foxe Basin in summer (between 79% and 97% of measured whales depending on the sample year). Their observations suggest that adult bowhead whales in Foxe Basin are likely to be nursing females. They suggest that most females without fetuses or calves and adult males occupy other parts of the range in the Eastern Canadian Arctic and West Greenland.

Additional information was obtained by modeling the bowhead data. A deterministic, stage-based population model was constructed to examine the relative impacts of four hypothetical hunting scenarios on the population recovery of the Eastern Canadian Arctic-West Greenland bowhead whale population. The model structure is described in Richard *et al.* (2003), except that the model used here had only three life stages (calf, juvenile, adult) and was deterministic (i.e., no uncertainty in parameter values). Population characteristics were selected based on a combination of best available information and subsequent assumptions that allowed the model to result in some positive population growth under a no hunting scenario and a small percentage of animals to survive to 120 years. Theoretical population sizes of 5,000 and 10,000 were examined because the population estimate has large uncertainties associated with it and, therefore, should be used with some caution.

The model examined the outcome for four hunting scenarios: "no hunting", an "adult only" hunt (equal gender ratio), an "adult-juvenile" hunt (age and gender class in equal numbers), and an "adult female" biased hunt (only adult females). In each scenario, except for "no hunting", 10 individuals[2] were removed annually from the population. An "adult only" hunt consisted of the removal of 5 adults of each sex. The "juvenile-adult" hunt consisted of the removal of 2.5 juvenile males, 2.5 juvenile females, 2.5 adult males, and 2.5 adult females. The "adult female" biased hunt consisted of the removal of 10 adult females.

The "adult female" only hunt scenario had the greatest negative effect on population growth, followed by "adult only", "juvenile-adult", and "no hunting" in decreasing order of impact. A juvenile-only hunt would have the least negative effect on population growth because it doesn't remove reproductively-active animals from the population. To minimize the impact of hunting on population recovery, bowhead whale hunting in northern Foxe Basin should target only juveniles (≤ 13.5 m or 44.3 feet in total length) because the few adults that spend the summer there are likely to be adult females. Since identifying the sex of adult bowhead whales at sea is difficult, to avoid hunting adult females, juvenile hunting is also the best choice everywhere else in the range of the population.

Adult males landed in Alaska between 1973-1989 ranged in length up to 16.2 m or 53.1 feet while adult females landed ranged up to 18.0 m or 59.1 feet (Koski *et al.* 1993). About a quarter

[2] This number was chosen arbitrarily to illustrate the relative results for hunt scenarios.

of the females measured in those hunts were longer than 16.2 m or 53.1 feet. This suggests that hunting animals larger than 16.2 m or 53.1 feet should be avoided in all areas. While this recommendation will not remove the risk of hunting adult females, it should reduce their frequency in the catch in areas where there are few or no juveniles to target and males and females are in equal proportion.

CONCLUSIONS AND ADVICE

Bowhead hunting in the Eastern Canadian Arctic can be structured to minimize its negative impact on the recovery of the Eastern Arctic-West Greenland population by using the following measures:

- targeting juvenile bowhead whales (≤ 13.5 m or 44.3 feet in total length, or 4.5 m or 14.8 feet in skull length), especially in northern Foxe Basin because the adults there are likely to be reproductive females
- avoiding adult bowhead whales longer than 16.2 m or 53.2 feet in total length (> 5.4 m or 17.7 feet in skull length)
- avoiding bowhead whales accompanied by small calves (< 7.5 m or 24.6 feet, Koski *et al.* 1993)

OTHER CONSIDERATIONS

Total length is difficult to assess at sea but the cranial length of a bowhead whale is slightly more than one third of its total body length (Haldiman and Tarpley 1993). So a rule of thumb to use to estimate the length of a whale at sea is that a bowhead whale's total length is just under three times the length of its skull, which can be measured as a straight line drawn between the tip of the upper jaw to the "neck" or depression between the blow hole and the back.

SOURCES OF INFORMATION

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